



KATHOLISCHE UNIVERSITÄT  
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Zusatztext und Beiträge in englischer Sprache zur  
kumulativen Dissertation zum Themengebiet:

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**Trading in the shadows:  
Three essays on the secondary market for leveraged loans**

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vorgelegt von

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## 1. Introduction

The dark side is on the rise. Over the last two decades, private markets, operating in the shadows of regulation, have grown exponentially and by now account for 18 T USD in gross assets. To date, private markets are hardly regulated. However, their continuous growth has raised concerns among regulators. In February 2022, Gary Gensler, the chair of the US Securities and Exchange Commission (SEC), announced new rules to shed light on this increasing but still opaque area of financial markets. He announced measures, such as audits of private funds, bans on excess fees, and prohibitions on preferential terms for certain investors in private markets.<sup>1</sup>

This dissertation sheds light on a fast-growing section of the private market: leveraged loans. These are high-risk loans, arranged by one or several commercial or investment banks (arrangers) and distributed to banks and other institutional investors. All three papers are concerned with the secondary market that is the trading of leveraged loans, in opposition to the primary market which describes credit supply to firms by lending institutions. This market is hardly observed by regulators and the public for two reasons. First, since loans are not securities, security laws (including anti-fraud and insider trading provisions) do not govern transactions in the secondary loan market. Second, public awareness of this market is minimal, simply because it is solely used by institutions not retail investors (Irani et al., 2020). Due to this private nature, I refer to trading leveraged loans as *trading in the shadows*.

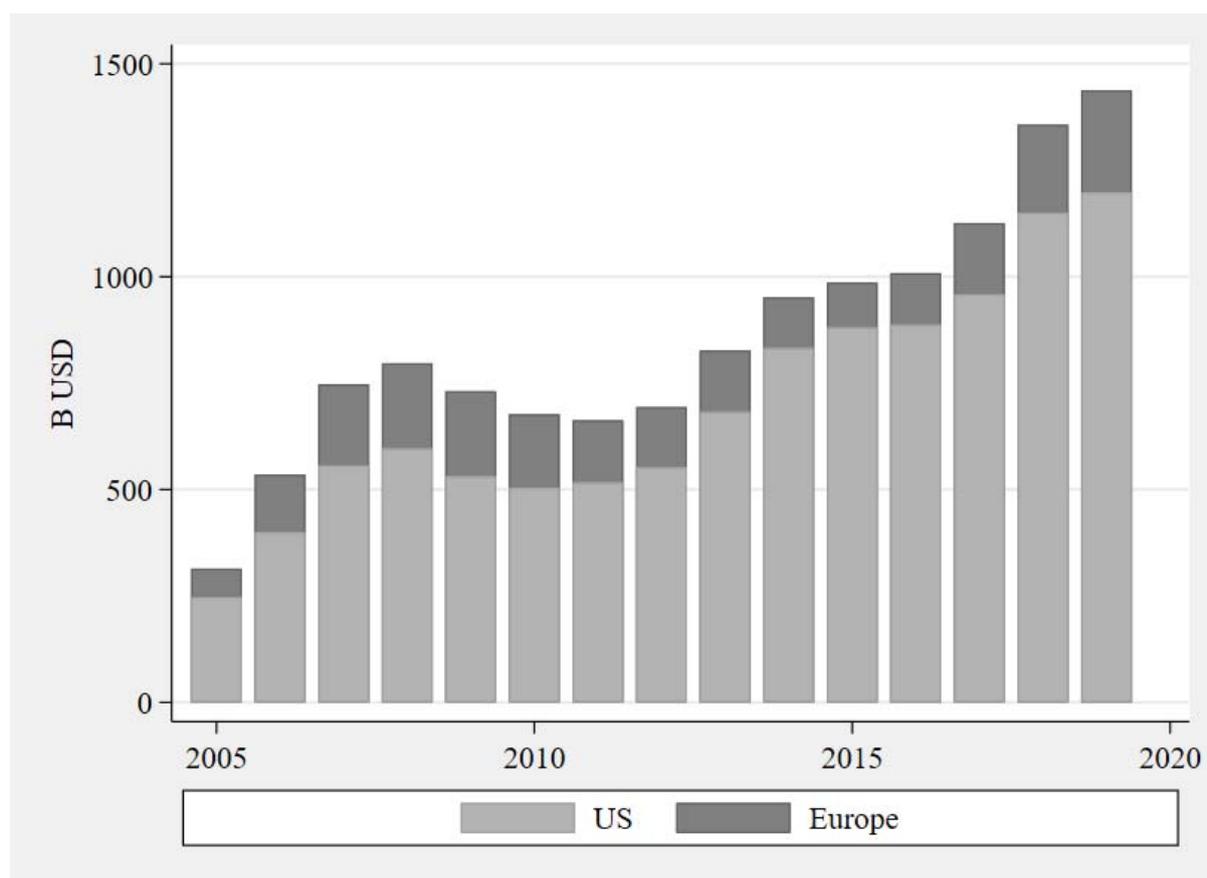
As Figure 1 depicts, the secondary market has faced tremendous growth since the financial crisis. From 2005 until 2019, the combined US and European market approximately quadrupled from 314 to 1,438 B USD in outstanding par volume. This corresponds to average annual growth rates of 27.4% (US) and 18.6% (Europe), leaving investors with respective outstanding par amounts of 1.20 and 0.24 T USD in 2019.

At the bottom line, this excessive growth motivates my dissertation. With increased growth comes increased importance. On the one hand, this describes the necessity of regulators to guide and intervene appropriately in the interest of the broader society, on the other hand, this also calls for trading strategies for investors to implement. Essays 1 and 2 consider regulatory aspects. Essay 1 investigates how trading impacts credit supply to firms. Essay 2 investigates

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<sup>1</sup> Source: Financial Times, February 9, 2022, SEC regulation is welcome news. Available at: <https://www.ft.com/content/e4d993e0-fa67-484d-9b60-f87e37bea3c1>. Also, SEC Commissioner Allison Herren Lee talks about the impact of growing private markets on investors and the economy in October 2021 (Speech available at: <https://www.sec.gov/news/speech/lee-sec-speaks-2021-10-12>).

whether institutions in the shadows act confirmatory in light of climate change. Finally, Essay 3 takes a practitioner's perspective, suggesting value and momentum strategies to investors. The remainder of this summary is structured as follows. Section 2 gives a short introduction to the institutional background of the dissertation. Chapter 3 provides a common frame for all three papers and summarizes key findings for each essay. It concludes with a table that provides technical details on the three essays, namely, authors, individual contributions, presentations at conferences, and a project timeline.

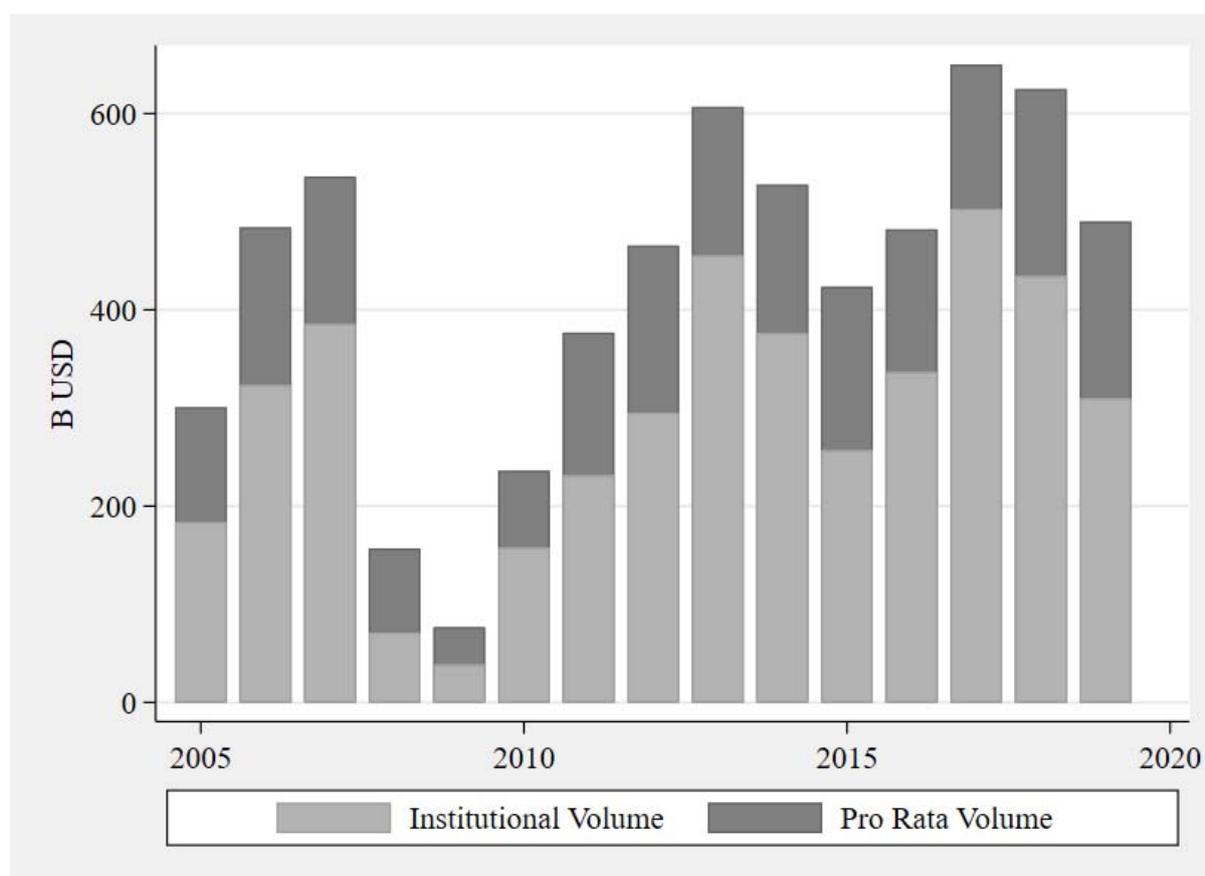


**Figure 1: Par volume in leveraged loans in the US and Europe.**

This figure shows the development of outstanding par volume in leveraged loans for the US and Europe. All loans that are in the broader S&P/LSTA Leveraged Loan Index or, respectively, in the S&P European Loan Index are included. Data comes from Standard and Poor's Leveraged Commentary & Data (LCD).

## 2. Institutional background

**Institutional investors.** To a large part, the growth in leveraged loans is due to increased interest by institutional investors. Figure 2 shows the primary market participation by banks and other institutions (nonbanks) over time. Generally, banks hold so-called pro-rata facilities and facilities held by nonbanks are referred to as institutional facilities (Irani et al., 2020). As can be seen in Figure 2, the main source of growth in leveraged loans is the increased participation of nonbank institutions in lending, whereas the bank lending portion stays more constant.



**Figure 2: Primary market participation of banks and other institutions.**

This figure shows the participation of nonbank institutions and banks in the primary market (lending) of leveraged loans. Institutional volume has a higher growth rate and is also more volatile, whereas lending by banks (called pro-rata lending) is more constant over time. Data comes from LCD.

The dominant institutional players are collateralized loan obligations (CLOs) with a current primary market share of approximately 70%, followed by loan mutual funds and exchange-traded funds (ETFs) for which the market share oscillates between 10-15% according to Standard and Poor's Leveraged Commentary & Data (LCD).

CLOs are, essentially, asset-backed securities, set up to hold and manage pools of leveraged loans, and to a lesser extent high-yield bonds. These investments are financed through the issuance of several debt and one or two equity tranches that have rights to the collateral and payment stream, in descending order. CLOs are issued by a special purpose vehicle/entity (SPV/SPE).

At the bottom line, one important feature that distinguishes CLOs from mutual loan funds is stability. CLOs are generally not required to mark-to-market their assets. They have a life cycle of approximately eight to ten years and are closed for most of the time, which means investors cannot redeem their investments. In contrast, loan mutual funds often allow redemptions on a monthly or even daily frequency.<sup>2</sup> This has raised stability concerns in the past: On the one hand, open-end loan mutual funds and ETFs are fueled with retail investors' money that can be withdrawn on short notice, on the other hand, these funds invest in leveraged loans that are infrequently traded and have long settlement durations. Mählmann (2022) finds that in times of loan market stress, fund flows and loan price returns have reinforced each other's movements. This fuels a downward price and liquidity spiral that could cause a "run-on-the-fund" phenomenon as Goldstein et al. (2017) show for bond funds.

**The secondary market.** Recall that Figure 2 shows an increasing, strong primary market presence of institutional investors. This, in turn, has fostered the establishment of a secondary market. The secondary market for leveraged loans is exclusively an institutional market with limited participation by banks (Irani et al., 2020). Generally, trading allows investors to transform their illiquid loans into liquidity and to profit from risk-sharing with a broader group of investors (Parlour and Winton, 2013). However, secondary markets can also be value-destroying by diluting the monitoring incentives of banks (Gorton and Pennacchi, 1995; Parlour and Plantin, 2008).

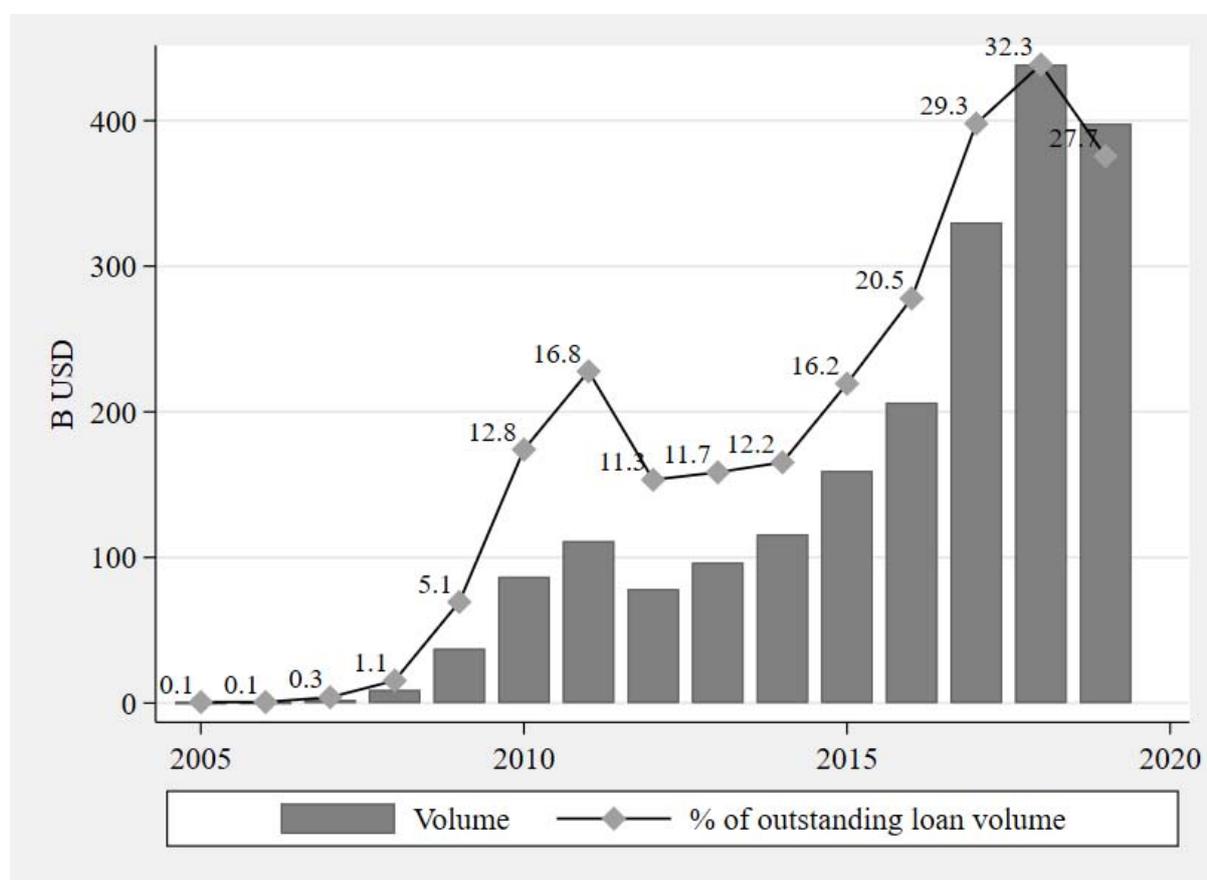
As Figure 3 illustrates, trading activity by CLOs, the largest institutional investor in this market, has inflated from less than 0.2 B USD to 398 B USD between 2005 and 2019. That is an increase from less than one percent to almost one-third of the total outstanding par volume. Trading takes place over-the-counter (OTC), with most transactions concluded on an intermediated basis; i.e., trades pass through decentralized loan dealer desks located at large

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<sup>2</sup> Loan mutual funds are typically closed-end or open-end. Closed-end funds either are exchange-traded (ETFs) or continuously offered, implying that investors can buy into these funds each day at the fund's net asset value (NAV) and redemptions are allowed at a monthly or quarterly frequency. Open-end mutual funds are so-called "daily-access" funds into which investors can buy or redeem shares each day at the fund's NAV.

investment banks acting as lead arrangers or transfer agents for a given facility. The market generally lacks pre-and post-trade transparency. Any potential trader cannot observe all dealer quotes in a central location or on a computer screen. Instead, the institution must call several dealers for quotes or subscribe to data vendors like Refinitiv LPC or Markit that broadcast near real-time bid and ask quotes aggregated across contributing dealers. As common for OTC markets, quotes are indicative, not firm.

After having characterized the leveraged loan market and its dominant institutional players, the following section explains how the three essays of the dissertation contribute to this research field in further detail.



**Figure 3: Leveraged loan trading by CLOs.**

This figure shows the trading activity of CLOs by leveraged loans from 2005 to 2019 in B USD and as a percentage of the total outstanding loan volume. Data is from CLO-i and LCD.

### 3. Essays of the cumulative dissertation

This section characterizes the three articles of the dissertation. Section 3.1 provides an overview on the common context of secondary loan market cheapness and underlying data and identification strategies of the essays; Section 3.2 outlines individual key results and provides a table with technical details, namely, authors, individual contributions, presentations at conferences, and a project timeline.

Trading in the shadows: Three essays on the secondary market for leveraged loans		
<b>1</b> <u>Essay 1:</u> <i>Credit supply externalities of a secondary loan market</i>	<b>2</b> <u>Essay 2:</u> <i>Do investors care about climate change risk – even if nobody looks? Evidence from the private market</i>	<b>3</b> <u>Essay 3:</u> <i>Value and momentum in private debt: Trading strategies for leveraged loans</i>
<b>Underlying concept of secondary market cheapness: During certain time periods a significant share of loans trades below their efficient price.</b>		
<u>Main data:</u> LCD, CLO-i (and Dealscan)	<u>Main data:</u> LCD, CLO-i	<u>Main data:</u> CLO-i (and Dealscan, Markit)
<u>Identification strategy:</u> Modified difference-in-difference	<u>Identification strategy:</u> Difference-in-difference	<u>Identification strategy:</u> Portfolio sorts
<u>Key finding:</u> A secondary market of nonbanks (differing in stability) imposes a negative externality on credit supply.	<u>Key finding:</u> If not regulated, investors in private markets are incentivized to invest into brown firms when markets are cheap.	<u>Key finding:</u> Aggregated short-term value and momentum are profitable trading strategies.

	Regulatory insights
	Practitioners' insights

**Figure 4: Classification of the three essays.**

This figure classifies the three essays of the dissertation in terms of the common concept “market cheapness”, applied data, identification strategy, and key findings.

#### 3.1 Overview

As in Figure 4, Essays 1 and 2 give regulatory insights on the topic of leveraged loans while Essay 3 gives implications for practitioners. At the bottom line, what the essays have in common, is that all three build upon the characterization of the secondary market as cheap or

rich, meaning that there exist periods during which a significant share of loans trades below or above their efficient price. Essays 1 and 2 further apply similar difference-in-difference identification strategies and all three essays apply the main data sources of CLO-i and LCD.

**Secondary market cheapness.** Essay 1 introduces the concept of market cheapness and shows that trading crowds-out lending when the secondary markets are cheap. In this setting, CLOs shift their focus from lending towards benefiting from attractive (“cheap”) discounts on securities in the secondary market that trade below their efficient price. Even though we do not explicitly characterize cheap market stages in Essay 2, the construct of market cheapness remains. Here, we investigate CLO purchasing behavior towards polluting (brown) and environmentally-friendly (green) firms as a response to the Paris Agreement, an external climate-change shock. CLOs respond by stocking up their inventory in brown firms when prices become cheap.

Methodologically, there is a difference within both settings: Essay 1 uses the first principal component of different cheapness indicators applied in the previous literature. Essay 2 applies an external shock that impacts the price of brown firms. Within both essays, CLOs are considered to be asset insulators. They are stable institutions that insulate the fundamental value of their assets from market pressures. While they can pick up on market cheapness, other institutions, like loan mutual funds, face selling pressures that promote downward pricing spirals (see e.g. Goldstein et al., 2017 for bonds).

Conclusions are similar: CLOs use their chance to profit from market cheapness. By making bargains on the secondary market, trading crowds out lending (Essay 1). CLOs act contrarian to climate-change objectives by shifting their focus towards making a bargain in buying brown loans, which shows the need to align CLOs incentives towards climate-friendly behavior; i.e. buying green loans.

Finally, Essay 3 picks up upon the concept of cheapness (so-called value) and constructs short-term value and momentum trading strategies. In other words, the essay advises practitioners to buy loans from countries or industries that are either cheap or that have performed above average in the last month.

**Applied data and identification strategies.** Since all three articles are on the secondary market of leveraged loans, the data applied has a strong overlap. Essay 1 investigates credit supply using data from LCD as well as CLO trades from CLO-i data (enriched with credit

spreads from DealScan). Essay 2 investigates the behavior of CLOs on the secondary market, equally applying CLO-i data. Additionally, it applies industry-level indices on secondary market prices from LCD. Finally, for the main analysis, Essay 3 applies index-level credit spreads of different industries and countries from LCD. In robustness tests, this essay additionally applies data from Dealscan and Markit.

Essays 1 and 2 have similar methods of identification. Both investigate responses to market cheapness. Recall that Essay 1 uses the principal component of several cheapness indicators while Essay 2 applies a cheapness shock (the Paris Agreement). Both essays apply this in a difference-in-difference setting, but consider that in the first case cheapness is a continuous variable, while it is binary in the latter. For Essay 1 difference-in-difference tests include the response of lending by nonbanks using bank lending as a counterfactual as well as a direct comparison of CLO lending and trading as a response to cheap markets. For Essay 2 the difference-in-difference setting is to identify CLO purchases in green and brown firms as a response to the Paris Agreement. Finally, Essay 3 applies portfolios sorts on value and momentum and calculates return and risk measures for the resulting portfolios.

### **3.2 Key findings and contribution**

After having established a common context, this section outlines key results and the contribution of each essay and presents a table concerning all technical details (authors, individual contributions, presentations at conferences, and a project timeline for each essay).

**Essay 1.** Essentially, Essay 1 tests for a negative market spillover effect of a secondary loan market on credit supply, applying the trading crowding-out lending theories of Diamond and Rajan (2011) and Shleifer and Vishny (2010). This literature argues that, if some actively trading nonbanks have less stable funding, a secondary loan market may exacerbate credit cycles during times of market-wide stress.

The argument is as follows. Because rational lenders allocate their limited funds to the market that offers the highest expected returns, price shocks in the secondary loan market – say, due to selling pressure by unstable nonbanks (i.e., loan mutual funds) – exert a negative externality on lending by stable nonbanks (i.e., CLOs) in the primary market. During times when traded prices of loans are temporarily depressed and the expected returns from trading are high, stable nonbanks allocate more of their funds to the secondary market and cut back on lending in the

presence of funding constraints. Put simply, stable nonbanks buy up the fire sales of unstable nonbanks.

Our findings indicate this trading channel of credit supply contraction. Nonbank lenders that are active loan traders decrease their credit supply relative to banks when the secondary market becomes cheap and the expected profitability of loan trading increases. Direct evidence from CLOs is consistent with the interpretation that credit is crowded out by nonbanks responding to profitable opportunities in the secondary loan market, rather than with a demand-based interpretation. The results suggest that the existence of a secondary loan market might have negative spillovers to the real economy, a possibility overlooked thus far.

**Essay 2.** Essay 2 contributes to the discussion about the regulation of private markets by taking climate change into the equation. It observes the behavior of CLOs, as a response to the Paris Agreement, representing a beacon in the battle against climate change. This setting aims at taking public awareness and regulation out of the equation to see how investors behave when not in the eye of the public (“nobody looks”). For this, the secondary market for leveraged loans; i.e., “the shadows”, offers a perfect setting.

We analyze changes in leveraged loan prices and trades that can be associated with changes in climate risk awareness during the Paris Agreement and the French Energy Transition Law in 2015 and find the following: CLOs do care about climate risks – just not the way climate activists would hope for. They further invest in brown firms and even increase their inventory when the overall prices of brown firms decline as a response to the Paris Agreement. Consistent with a supply influx in brown firms, CLOs benefit from cheap market conditions. They purchase brown loans at a 1.0 percentage point discount and at the same time, their total purchasing volume in brown firms increases by more than 10 % of the average purchasing volume in our observation period. This effect reverses, when regulatory risk increases through more concrete threats; i.e., those of the French Energy Transition Law that also tackles reporting requirements for credit givers and institutional investors in France.

Investigating the behavior of market players that are not under the scrutiny of regulation or public attention contributes to recently developing literature on climate change (see Bolton et al. (2021) and Giglio et al. (2021) for an overview). Most importantly, it calls for including private markets in the debate of climate change regulation.

**Essay 3.** Essay 3 adds to recent empirical asset pricing literature by analyzing aggregate short-term (one-month) value and momentum strategies on the loan market ( e.g., Asness et al., 2013; Beyhaghi and Ehsani, 2017). It applies portfolio sorts on aggregate industry and country excess returns for four different panels in the US and Europe with almost seventy years of combined data. This novel approach of aggregating leveraged loans ensures tradability as investors can choose from available facilities within an industry or country portfolio. Sorting countries into terciles of *HIGH*, *MEDIUM*, and *LOW* according to value and momentum results in annualized credit excess returns of long *HIGH*-value portfolios from 548 bps to 1,040 bps; and long *HIGH*-momentum returns from 429 bps to 1,358 bps. Annualized Sharpe ratios span 0.93 to 1.45 and 1.11 to 1.64, respectively. These profits are neither compensation for default risk nor liquidity provision.

These findings contribute to pronounced interest by institutional investors in systematic credit investing (Frieda and Richardson, 2016). There has been an extensive application of factor models in fixed income, primarily in corporate bonds, by practitioners and academics (see, e.g., Davis and Taylor, 2019; Henke et al., 2020; Houweling and Van Zundert, 2017; Israel et al., 2018; L’Hoir and Boulhabel, 2010; Parker and Rosenberg, 2019).

**Table 1: Technical details on the three essays.**

This table names authors, individual contributions, presentations at conferences, and a project timeline for each essay.

<b>Title</b>	<b>Credit supply externalities of a secondary loan market</b>	<b>Do investors care about climate change risk – even if nobody looks? Evidence from the private market</b>	<b>Value and momentum in private debt: Trading strategies for leveraged loans</b>
<b>Authors</b>	<p><b>Kathrin E. Hackenberg</b> Chair of BA, Finance and Banking Catholic University of Eichstätt-Ingolstadt Auf der Schanz 49, 85049 Ingolstadt</p> <p><b>Prof. Dr. Thomas Mählmann</b> Chair BA, Finance and Banking Catholic University of Eichstätt-Ingolstadt Auf der Schanz 49, 85049 Ingolstadt</p>	<p><b>Kathrin E. Hackenberg</b> Chair of BA, Finance and Banking Catholic University of Eichstätt-Ingolstadt Auf der Schanz 49, 85049 Ingolstadt</p> <p><b>Viktoria K. Klaus</b> Institute for Finance Karlsruhe Institute of Technology (KIT) Blücherstraße 17, 76185 Karlsruhe</p>	<p><b>Kathrin E. Hackenberg</b> Chair of BA, Finance and Banking, Catholic University of Eichstätt-Ingolstadt Auf der Schanz 49, 85049 Ingolstadt</p>
<b>Conferences</b>	DGF Doctoral Workshop 2021	Finance and Econometrics Research and Networking Seminar at KIT (accepted)	
<b>Contribution</b>	It is joint work with Prof. Dr. Thomas Mählmann. Thomas Mählmann developed the original idea and test-setting. Kathrin Hackenberg collected the data, performed and interpreted the analysis, and was responsible for the presentation and interpretation of the results. Thomas Mählmann is mainly responsible for writing the current draft.	It is joint work with Viktoria Klaus. Kathrin Hackenberg designed the original idea, which was then jointly developed and pre-tested with Viktoria Klaus. To date, Kathrin Hackenberg performed the main data work, analysis, and interpretation of results which are still in development. She wrote the first draft jointly with Viktoria Klaus.	Single-authored
<b>Project timeline</b>	The project started in spring 2020 with the analysis of obtained LCD data. The first draft of the paper was completed in 2021 and first presented in fall 2021.	First pre-tests started in spring 2021. The first draft of the paper was finished in February 2022. The paper will be presented at conferences to obtain feedback in 2022. It should be finished and ready for publication by end-2022.	The project began in the summer of 2021 and was finished in the beginning of 2022. It is currently under revision at the Journal of Portfolio Management.

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**1. Credit supply externalities of a secondary loan market**

We analyze the primary and secondary market for leveraged loans over the period from January 2010 to January 2020. Our findings indicate a trading channel of credit supply contraction. Nonbank lenders that are active loan traders decrease their credit supply relative to banks when the secondary market becomes cheap and expected profitability of loan trading increases. Direct evidence from collateralized loan obligations, the largest nonbank lenders, is consistent with the interpretation that credit is crowded out by nonbanks responding to profitable opportunities in the secondary loan market, rather than with a demand-based interpretation. The results suggest that the existence of a secondary loan market might have negative spillovers to the real economy, a possibility overlooked thus far.

**2. Do investors care about climate change risk – even if nobody looks? Evidence from the private market**

This paper contributes to the discussion about the regulation of private markets by taking climate change into the equation. It aims at filtering out factors of public awareness and regulation to see how investors behave on private markets, where “nobody looks”. We analyze changes in leveraged loan index prices and trades that can be associated with changes in climate risk awareness during the Paris Agreement and the French Energy Transition Law in 2015. CLOs, the largest players on the leveraged loan market and barely regulated or publicly observed institutional investors, do care about climate risks – just not the way climate activists would hope for: They further invest in brown firms and even increase their inventory when the overall prices of these decline as a response to the Paris Agreement. The effect reverses in face of more concrete regulatory threats of the French Energy Transition Law.

**3. Value and momentum in private debt: Trading strategies for leveraged loans**

This paper applies empirical asset pricing literature on the leveraged loan market by analyzing short-term (one-month) value and momentum strategies. We apply portfolio sorts on aggregate industry and country excess returns for four different panels in the US and Europe with almost seventy years of combined data. This novel approach of aggregating leveraged loans ensures tradability as investors can choose from available facilities within an industry or country portfolio. Sorting countries into terciles of *HIGH*, *MEDIUM*, and *LOW* according to value and momentum results in annualized credit excess returns of long *HIGH*-value portfolios from 548 bps to 1,040 bps; and long *HIGH*-momentum returns from 429 bps to 1,358 bps. Annualized Sharpe ratios span 0.93 to 1.45 and 1.11 to 1.64, respectively. These profits are neither compensation for default risk nor liquidity provision.